TOYO-F40

MODBUS PROTOCOL &
MEMORY MAP DOCUMENT

OCR/OCGR/OVR/UVR/OVGR/SGR/NSOVR

Rev Date: 2008-10-23
Revision Document: 1.1
Firmware: 1.0
Hardware: 1.0

For further information, contact:

Toyo Technical Co, Ltd.	Tel:+886-2-8791-8588
6F No.68 Xing-Ai Road	Fax:+886-2-8791-9588
Taipei City 11494, TAIWAN	http://www.toyotech.com.tw

REVISIONS

REV	Date	Description/Reason	Initiated By
1.0	23-10-2008	Draft	
1.1	06-08-2013	Draft	

TABLE OF CONTENTS

1. Scope

This document describes the Modbus RTU register map for the OCR/ OCGR/ OVR/ UVR/ OVGR/SGR/NSOVR

2. Applicable Document

Modicon Modbus Protocol Reference Guide
DWG#:PI-MBUS-300 Rev.E

This document describes the Modicon Modbus RTU communication protocol used by the OCR/OCGR/OVR/UVR/OVGR/SGR/NSOVR

The device configuration parameters, such as baud rate, is only accessible via debug port on the device.

Because MODBUS is a multidrop network, the operator is responsible to make sure no 2 devices have the same ID on the network, The device ID can range from 1 – 254 only.

3. Register Types

The registers are mapped in order listed below.

Register Type	Category	Function Code	Start Address	Use/Contents	Access
Input Registers	Fixed Value Registers	0x03(03)	0000	Fixed data reported by the device	R/O
		0x03(03)	6500	Password	R/O
Input Registers	Dynamic Value Registers	0x04(04)	1000	Metering data	R/O
			1500	Status data	
Set-point Registers	Setting Registers		2000	Counter	
Report Registers	Fault Registers		3000	Device Configuration	
			4000	Circuit Breaker Control	
Coil Registers	Coil Command Registers	0x05(05)	2500	Command coils used for activation	W/O
Set-point Registers	Setting Registers	0x06(06)	3000	Device Configuration	W/O
			4000	Circuit Breaker Control	
		0x10(16)	3000	Device Configuration	W/O
			4000	Circuit Breaker Control	

4. Functions and message parsing

The OCR supports a subset of Modbus commands. All the supported commands are listed below.

Function Code		Modbus Definition	TOYO Definition	Register Groups
0x03	03	Read Holding Registers	Read Actual Values of Set-points	Set-point & Control registers and fixed values
0x04	04	Read Input Registers	Read Actual Values of Set-points, values of Multiple Set-points	Dynamic values, events, Set-point registers fault and reports
0x05	05	Force Single Coil	Execute Operation	Coil registers
0x06	06	Preset Single Register	Program Set-points	Set-point registers
0x10	16	Preset Multiple Register	Program Multiple Set-points	Set-point registers

5. Exception Responses

When a system host command received by a OCR/OCGR/OVR/UVR/OVGR/SGR/NOVR cannot be performed, it replies with an error code.

01- illegal function
02- illegal register address
03- illegal data value
04- slave device failure
05- acknowledge long duration command
06- busy servicing another long duration command
07- negative acknowledge
08- invalid report index

6. Data Formats

Format	Description	Etc.
ASCII	16bits assigned ASCII	Ex) '1'->0x0031
INT16U	0~65535	H-L Order Ex) 0x1234 --> 0x1234
INT16S	-32768 ~ 32767	
INT32U	0 ~ 4294967295	LL-HH Order Ex) 0x1234-0x5678 --> 0x56781234
INT32S	-2147483648 ~ 2147483647	
Bit Struct	16bits Bit Structure	

7. Communication Configuration

Operation	Half-Duplex (2-wire)	
Interface	RS-232, RS-485	
Baud	RS-232	19200
	RS-485	300, 600, 1200, 2400, 4800, 9600, 19200
Protocol	Modbus RTU	
Data Bit	8 bit	
Stop Bit	1 bit	
Parity Bit	None(0)	

8. Register Map

Address (dec)	Func Code	Description	Range	Access	Format	Units
Device Identity						
0000~11	0x03	Device Type	12 characters "TOYO-F40"	R/O	ASCII	--
0012~15	0x03	S/W Version	4 characters "1.00"	R/O	ASCII	--
0016 ~		Reserved				
Measurement						
1000 ~ 1001	0x04	Phase A Voltage Magnitude	0 ~ 1625000.00	R/O	INT32U	V
1002 ~ 1003	0x04	Phase A Voltage Angle	0 ~ 359.9	R/O	INT32U	°(deg)
1004 ~ 1005	0x04	Phase B Voltage Magnitude	0 ~ 1625000.00	R/O	INT32U	V
1006 ~ 1007	0x04	Phase B Voltage Angle	0 ~ 359.9	R/O	INT32U	°(deg)
1008 ~ 1009	0x04	Phase C Voltage Magnitude	0 ~ 1,625000.00	R/O	INT32U	V
1010 ~ 1011	0x04	Phase C Voltage Angle	0 ~ 359.9	R/O	INT32U	°(deg)
1012 ~ 1013	0x04	Phase N Voltage Magnitude	0 ~ 1625000.00	R/O	INT32U	V
1014 ~ 1015	0x04	Phase N Voltage Angle	0 ~ 359.9	R/O	INT32U	°(deg)
1016 ~ 1017	0x04	Line AB Voltage Magnitude	0 ~ 1,625000.00	R/O	INT32U	V
1018 ~ 1019	0x04	Line AB Voltage Angle	0 ~ 359.9	R/O	INT32U	°(deg)
1020 ~ 1021	0x04	Line BC Voltage Magnitude	0 ~ 1,625000.00	R/O	INT32U	V
1022 ~ 1023	0x04	Line BC Voltage Angle	0 ~ 359.9	R/O	INT32U	°(deg)
1024 ~ 1025	0x04	Line CA Voltage Magnitude	0 ~ 1,625,000.00	R/O	INT32U	V
1026 ~ 1027	0x04	Line CA Voltage Angle	0 ~ 359.9	R/O	INT32U	°(deg)
1028 ~ 1029	0x04	Phase A Current Magnitude	0 ~ 7500000.00	R/O	INT32U	A
1030 ~ 1031	0x04	Phase A Current Angle	0 ~ 359.9	R/O	INT32U	°(deg)
1032 ~ 1033	0x04	Phase B Current Magnitude	0 ~ 7500000.00	R/O	INT32U	A
1034 ~ 1035	0x04	Phase B Current Angle	0 ~ 359.9	R/O	INT32U	°(deg)
1036 ~ 1037	0x04	Phase C Current Magnitude	0 ~ 7500000.00	R/O	INT32U	A
1038 ~ 1039	0x04	Phase C Current Angle	0 ~ 359.9	R/O	INT32U	°(deg)
1040 ~ 1041	0x04	Phase N Current Magnitude	0 ~ 7500000.00	R/O	INT32U	A
1042 ~ 1043	0x04	Phase N Current Angle	0 ~ 359.9	R/O	INT32U	°(deg)

1044 ~ 1045	0x04	Sensitive Current Is Magnitude	0 ~ 6553.50	R/O	INT32U	mA
1046 ~ 1047	0x04	Sensitive Current Is Angle	0 ~ 359.9	R/O	INT32U	°(deg)
1048 ~ 1049	0x04	Phase A Power Factor	-1.00 ~ 1.00	R/O	INT32S	--
1050 ~ 1051	0x04	Phase B Power Factor	-1.00 ~ 1.00	R/O	INT32S	--
1052 ~ 1053	0x04	Phase C Power Factor	-1.00 ~ 1.00	R/O	INT32S	--
1054 ~ 1055	0x04	Total Power Factor	-1.00 ~ 1.00	R/O	INT32S	--
1056 ~ 1057	0x04	Positive Sequence Voltage Magnitude	0 ~ 1625000.00	R/O	INT32U	V
1058 ~ 1059	0x04	Positive Sequence Voltage Angle	0 ~ 359.9	R/O	INT32U	°(deg)
1060 ~ 1061	0x04	Negative Sequence Voltage Magnitude	0 ~ 1625000.00	R/O	INT32U	V
1062 ~ 1063	0x04	Negative Sequence Voltage Angle	0 ~ 359.9	R/O	INT32U	°(deg)
1064 ~ 1065	0x04	Zero Sequence Voltage Magnitude	0 ~ 1625000.00	R/O	INT32U	V
1066 ~ 1067	0x04	Zero Sequence Voltage Angle	0 ~ 359.9	R/O	INT32U	°(deg)
1068 ~ 1069	0x04	Positive Sequence Current Magnitude	0 ~ 7500000.00	R/O	INT32U	A
1070 ~ 1071	0x04	Positive Sequence Current Angle	0 ~ 359.9	R/O	INT32U	°(deg)
1072 ~ 1073	0x04	Negative Sequence Current Magnitude	0 ~ 7500000.00	R/O	INT32U	A
1074 ~ 1075	0x04	Negative Sequence Current Angle	0 ~ 359.9	R/O	INT32U	°(deg)
1076 ~ 1077	0x04	Zero Sequence Current Magnitude	0 ~ 7500000.00	R/O	INT32U	A
1078 ~ 1079	0x04	Zero Sequence Current Angle	0 ~ 359.9	R/O	INT32U	°(deg)
1080 ~ 1081	0x04	Phase A Watt	-2147483647 ~ 2147483647	R/O	INT32S	W
1082 ~ 1083	0x04	Phase B Watt		R/O	INT32S	W
1084 ~ 1085	0x04	Phase C Watt		R/O	INT32S	W
1086 ~ 1087	0x04	Total Watt		R/O	INT32S	W
1088 ~ 1089	0x04	Phase A Var		R/O	INT32S	var
1090 ~ 1091	0x04	Phase B Var		R/O	INT32S	var
1092 ~ 1093	0x04	Phase C Var		R/O	INT32S	var
1094 ~ 1095	0x04	Total Var		R/O	INT32S	var
1096 ~ 1097	0x04	Phase A VA	0 ~ 4294967295	R/O	INT32U	VA

1098 ~ 1099	0x04	Phase B VA		R/O	INT32U	VA
1100 ~ 1101	0x04	Phase C VA		R/O	INT32U	VA
1102 ~ 1103	0x04	Total VA		R/O	INT32U	VA
1104 ~ 1105	0x04	Watt-Hour	0 ~ 999999999	R/O	INT32U	Watth
1106 ~ 1107	0x04	Var-Hour	0 ~ 999999999	R/O	INT32U	Varh
1108 ~ 1109	0x04	Frequency	38.001 ~ 99.999	R/O	INT32U	Hz
1110 ~		Reserved				
Status						
		Self - Diagnosis				
1500	0x04	DC Power	OK(0), ERROR(1)	R/O	INT16U	--
1501	0x04	CPU WatchDog	OK(0), ERROR(1)	R/O	INT16U	--
1502	0x04	Memory	OK(0), ERROR(1)	R/O	INT16U	--
1503	0x04	Setting	OK(0), ERROR(1)	R/O	INT16U	--
1504	0x04	A/D Convertor	OK(0), ERROR(1)	R/O	INT16U	--
1505	0x04	DO/I Circuit	OK(0), ERROR(1)	R/O	INT16U	--
		Protection - TOCR				
1506	0x04	TOCR_A Pickup	NOP(0), Pickup(1)	R/O	INT16U	--
1507	0x04	TOCR_B Pickup	NOP(0), Pickup(1)	R/O	INT16U	--
1508	0x04	TOCR_C Pickup	NOP(0), Pickup(1)	R/O	INT16U	--
1509	0x04	TOCR_A OP Latch	NOP(0), OP(1)	R/O	INT16U	--
1510	0x04	TOCR_B OP Latch	NOP(0), OP(1)	R/O	INT16U	--
1511	0x04	TOCR_C OP Latch	NOP(0), OP(1)	R/O	INT16U	--
		Protection - IOCR				
1512	0x04	IOCR_A Pickup	NOP(0), Pickup(1)	R/O	INT16U	--
1513	0x04	IOCR_B Pickup	NOP(0), Pickup(1)	R/O	INT16U	--
1514	0x04	IOCR_C Pickup	NOP(0), Pickup(1)	R/O	INT16U	--
1515	0x04	IOCR_A OP Latch	NOP(0), OP(1)	R/O	INT16U	--
1516	0x04	IOCR_B OP Latch	NOP(0), OP(1)	R/O	INT16U	--
1517	0x04	IOCR_C OP Latch	NOP(0), OP(1)	R/O	INT16U	--
		Protection - TOCGR				
1518	0x04	TOCGR Pickup	NOP(0), Pickup(1)	R/O	INT16U	--
1519	0x04	TOCGR OP Latch	NOP(0), OP(1)	R/O	INT16U	--
		Protection - IOCGR				
1520	0x04	IOCGR Pickup	NOP(0), Pickup(1)	R/O	INT16U	--
1521	0x04	IOCGR OP Latch	NOP(0), OP(1)	R/O	INT16U	--
		Protection - SGR				
1522	0x04	SGR Pickup	NOP(0), Pickup(1)	R/O	INT16U	--
1523	0x04	SGR OP Latch	NOP(0), OP(1)	R/O	INT16U	--
		Protection - OVR				
1524	0x04	OVR_A Pickup	NOP(0), Pickup(1)	R/O	INT16U	--
1525	0x04	OVR_B Pickup	NOP(0), Pickup(1)	R/O	INT16U	--
1526	0x04	OVR_C Pickup	NOP(0), Pickup(1)	R/O	INT16U	--
1527	0x04	OVR_A OP Latch	NOP(0), OP(1)	R/O	INT16U	--
1528	0x04	OVR_B OP Latch	NOP(0), OP(1)	R/O	INT16U	--
1529	0x04	OVR_C OP Latch	NOP(0), OP(1)	R/O	INT16U	--
		Protection - UVR				
1530	0x04	UVR_A Pickup	NOP(0), Pickup(1)	R/O	INT16U	--
1531	0x04	UVR_B Pickup	NOP(0), Pickup(1)	R/O	INT16U	--
1532	0x04	UVR_C Pickup	NOP(0), Pickup(1)	R/O	INT16U	--
1533	0x04	UVR_A OP Latch	NOP(0), OP(1)	R/O	INT16U	--
1534	0x04	UVR_B OP Latch	NOP(0), OP(1)	R/O	INT16U	--
1535	0x04	UVR_C OP Latch	NOP(0), OP(1)	R/O	INT16U	--

		Protection - TOVGR				
1536	0x04	TOVGR Pickup	NOP(0), Pickup(1)	R/O	INT16U	--
1537	0x04	TOVGR OP Latch	NOP(0), OP(1)	R/O	INT16U	--
		Protection - IOVGR				
1538	0x04	IOVGR Pickup	NOP(0), Pickup(1)	R/O	INT16U	--
1539	0x04	IOVGR OP Latch	NOP(0), OP(1)	R/O	INT16U	--
		Protection - NSOVR				
1540	0x04	NSOVR Pickup	NOP(0), Pickup(1)	R/O	INT16U	--
1541	0x04	NSOVR OP Latch	NOP(0), OP(1)	R/O	INT16U	--
		Digital Input				
1542	0x04	CB Input 52a	DeEnergized(0), Energized(1)	R/O	INT16U	--
1543	0x04	CB Input 52b	DeEnergized(0), Energized(1)	R/O	INT16U	--
		CB Control				
1544	0x04	CB Local / Remote Status	Local(0), Remote(1)	R/O	INT16U	--
1545	0x04	CB Control Status	FN105	R/O	INT16U	--
		Contact Output				
1546 ~ 1555	0x04	T/S #01 ~ #10	DeEnergized(0), Energized(1)	R/O	INT16U	--
1556 ~		Reserved				
Counter						
2000	0x04	Event Counter	0 ~ 1024	R/O	INT16U	--
2001	0x04	Waveform Counter	0 ~ 6	R/O	INT16U	--
2002 ~		Reserved				
Control(BO)						
2500	0x05	Remote Reset	FF00 only	W/O	--	--
2501	0x05	Clear Event	FF00 only	W/O	--	--
2502	0x05	Clear Waveform	FF00 only	W/O	--	--
2503	0x05	Clear Energy	FF00 only	W/O	--	--
2504	0x05/0x06	CB Open Control	FF00 only (65280)	W/O	FN20	--
2505	0x05/0x06	CB Close Control	FF00 only (65280)	W/O		
2506 ~		Reserved				
System Configuration						
		System Time				
3000	0x04/0x06/0x10	Year	2000 ~ 2099 (1 step)	R/W	INT16U	--
3001	0x04/0x06/0x10	Month	1 ~ 12 (1 step)	R/W	INT16U	--
3002	0x04/0x06/0x10	Day	1 ~ 31 (1 step)	R/W	INT16U	--
3003	0x04/0x06/0x10	Hour	0 ~ 23 (1 step)	R/W	INT16U	--
3004	0x04/0x06/0x10	Minute	0 ~ 59 (1 step)	R/W	INT16U	--
3005	0x04/0x06/0x10	Second	0 ~ 59 (1 step)	R/W	INT16U	sec
3006	0x04/0x06/0x10	Millisecond	0 ~ 990 (10 step)	R/W	INT16U	msec
		Waveform Record				
3007	0x04/0x06/0x10	Trig Pos	0 ~ 99 (1 step)	R/W	INT16U	%
3008	0x04/0x06/0x10	Trig Src	OP(0), PKP(1), OP+PKP(2)	R/W	INT16U	--
3009	0x04/0x06/0x10	In/Is	In(0), Is(1)	R/W	INT16U	%
		Communication				
3010	0x04/0x06/0x10	Modbus Address(Slave Address)	1 ~ 254 (1 step)	R/W	INT16U	--
3011	0x04/0x06/0x10	BPS	FN100	R/W	INT16U	--
		Power System				
3012	0x04/0x06/0x10	Frequency	50Hz(0), 60Hz(1)	R/W	INT16U	Hz
3013	0x04/0x06/0x10	PT Connect	WYE(0), DEL(1), NONE(2)	R/W	INT16U	--
3014	0x04/0x06/0x10	Phase PT Secondary	50.0 ~ 240.0 (0.1 step)	R/W	INT16U	V
3015	0x04/0x06/0x10	Phase PT Ratio	0.1~6500.0 (0.1step)	R/W	INT16U	xxxx.x:1
3016	0x04/0x06/0x10	Ground PT Secondary	50.0~240.0 (0.1step)	R/W	INT16U	V
3017	0x04/0x06/0x10	Ground PT Ratio	0.1 ~ 6500.0 (0.1 step)	R/W	INT16U	xxxx.x:1
3018	0x04/0x06/0x10	Phase CT Ratio	5 ~ 30000 (5 step)	R/W	INT16U	xxxxx:5
3019	0x04/0x06/0x10	Ground CT Ratio	5 ~ 30000 (5 step)	R/W	INT16U	xxxxx:5
3020 ~		Reserved				
		Protection				
3500	0x04/0x06/0x10	TOCR	Function	Disable(0), Enable(1)	R/W	INT16U	--
3501	0x04/0x06/0x10	TOCR	Curve	FN101	R/W	INT16U	--

3502	0x04/0x06/0x10		PickUp		0.2 ~ 16.0 (0.1step)	R/W	INT16U	A
3503	0x04/0x06/0x10		Time Dial		0.05 ~10.00 (0.05 step)	R/W	INT16U	--
3504	0x04/0x06/0x10		DT Time		0.04 ~ 60.00 (0.01 step)	R/W	INT16U	sec
3505	0x04/0x06/0x10	IOCR	Function		Disable(0), Enable(1)	R/W	INT16U	--
3506	0x04/0x06/0x10		Curve		DT(0), INST(1)	R/W	INT16U	--
3507	0x04/0x06/0x10		PickUp		1.0 ~ 100.0 (0.5 step)	R/W	INT16U	A
3508	0x04/0x06/0x10		DT Time		0.04 ~ 60.00 (0.01 step)	R/W	INT16U	sec
3509	0x04/0x06/0x10	TOCGR	Function		Disable(0), Enable(1)	R/W	INT16U	--
3510	0x04/0x06/0x10		Curve		FN102	R/W	INT16U	--
3511	0x04/0x06/0x10		Direction		FN104	R/W	INT16U	--
3512	0x04/0x06/0x10		In PickUp		0.1 ~ 10.0 (0.1 step)	R/W	INT16U	A
3513	0x04/0x06/0x10		Time Dial		0.05 ~ 10.00 (0.05 step)	R/W	INT16U	--
3514	0x04/0x06/0x10		DT Time		0.04 ~ 60.00 (0.01 step)	R/W	INT16U	sec
3515	0x04/0x06/0x10		Vn PickUp		5 ~ 170 (1 step)	R/W	INT16U	V
3516	0x04/0x06/0x10		MTA		-90° ~ 90° (1 step)	R/W	INT16S	°
3517	0x04/0x06/0x10	IOCGR	Function		Disable(0), Enable(1)	R/W	INT16U	--
3518	0x04/0x06/0x10		Curve		DT(0), INST(1)	R/W	INT16U	--
3519	0x04/0x06/0x10		Direction		FN104	R/W	INT16U	--
3520	0x04/0x06/0x10		In PickUp		0.5 ~ 50.0 (0.1 step)	R/W	INT16U	A
3521	0x04/0x06/0x10		DT Time		0.04 ~ 60.00 (0.01 step)	R/W	INT16U	sec
3522	0x04/0x06/0x10		Vn PickUp		5 ~ 170 (1 step)	R/W	INT16U	V
3523	0x04/0x06/0x10		MTA		-90° ~ 90° (1 step)	R/W	INT16S	°
3524	0x04/0x06/0x10	SGR	Function		Disable(0), Enable(1)	R/W	INT16U	--
3525	0x04/0x06/0x10		Curve		DT(0), NI(1)	R/W	INT16U	--
3526	0x04/0x06/0x10		Direction		FN104	R/W	INT16U	--
3527	0x04/0x06/0x10		Is PickUp		0.9 ~ 250.0 (0.1 step)	R/W	INT16U	mA
3528	0x04/0x06/0x10		Time Dial		0.05 ~ 10.00 (0.05 step)	R/W	INT16U	--
3529	0x04/0x06/0x10		DT Time		0.04 ~ 60.00 (0.01 step)	R/W	INT16U	sec
3530	0x04/0x06/0x10		Vn PickUp		5 ~ 170 (1 step)	R/W	INT16U	V
3531	0x04/0x06/0x10		MTA		-90° ~ 90° (1 step)	R/W	INT16S	°
3532	0x04/0x06/0x10	OVR	Function		Disable(0), Enable(1)	R/W	INT16U	--
3533	0x04/0x06/0x10		Curve		DT(0), NI(1)	R/W	INT16U	--
3534	0x04/0x06/0x10		PickUp		5 ~ 170 (1 step)	R/W	INT16U	V
3535	0x04/0x06/0x10		Time Dial		0.05 ~ 10.00 (0.05 step)	R/W	INT16U	--
3536	0x04/0x06/0x10		DT Time		0.04 ~ 60.00 (0.01 step)	R/W	INT16U	sec
3537	0x04/0x06/0x10	UVR	Function		Disable(0), Enable(1)	R/W	INT16U	--
3538	0x04/0x06/0x10		Curve		DT(0), NI(1)	R/W	INT16U	--
3539	0x04/0x06/0x10		PickUp		5 ~ 170 (1 step)	R/W	INT16U	V
3540	0x04/0x06/0x10		Time Dial		0.05 ~ 10.00 (0.05 step)	R/W	INT16U	--
3541	0x04/0x06/0x10		DT Time		0.04 ~ 60.00 (0.01 step)	R/W	INT16U	sec
3542	0x04/0x06/0x10		OP Mode		Digital(0), Induction(1)	R/W	INT16U	--
3543	0x04/0x06/0x10	TOVGR	Function		Disable(0), Enable(1)	R/W	INT16U	--
3544	0x04/0x06/0x10		Curve		DT(0), NI_Trip(1), NI_Alarm(2)	R/W	INT16U	--
3545	0x04/0x06/0x10		PickUp		5 ~ 170 (1 step)	R/W	INT16U	V
3546	0x04/0x06/0x10		Time Dial		0.05 ~ 10.00 (0.05 step)	R/W	INT16U	--
3547	0x04/0x06/0x10		DT Time		0.04 ~ 60.00 (0.01 step)	R/W	INT16U	sec
3548	0x04/0x06/0x10	IOVGR	Function		Disable(0), Enable(1)	R/W	INT16U	--
3549	0x04/0x06/0x10		Curve		DT(0), Inst(1)	R/W	INT16U	--
3550	0x04/0x06/0x10		PickUp		10 ~ 170 (1 step)	R/W	INT16U	V
3551	0x04/0x06/0x10		DT Time		0.03 ~ 60.00 (0.01 step)	R/W	INT16U	sec
3552	0x04/0x06/0x10	NSOVR	Function		Disable(0), Enable(1)	R/W	INT16U	--
3553	0x04/0x06/0x10		PickUp		5 ~ 170 (1 step)	R/W	INT16U	V
3554	0x04/0x06/0x10		DT Time		0.04 ~ 60.00 (0.01 step)	R/W	INT16U	sec
		Trip / Signal Output						
3555	0x04/0x06/0x10	Contact Output	T/S #01	Connection	FN103	R/W	INT16U	--
3556				Reset	Self(0), Manual(1)	R/W	INT16U	--
3557				Reset Delay	0 ~ 200.00 (0.01step)	R/W	INT16U	sec
3558	0x04/0x06/0x10		T/S #02	Connection	FN103	R/W	INT16U	--

		Contact Output						
3559				Reset	Self(0), Manual(1)	R/W	INT16U	--
3560				Reset Delay	0 ~ 200.00 (0.01step)	R/W	INT16U	sec
3561	0x04/0x06/0x10	Contact Output	T/S #03	Connection	FN103	R/W	INT16U	--
3562				Reset	Self(0), Manual(1)	R/W	INT16U	--
3563				Reset Delay	0 ~ 200.00 (0.01step)	R/W	INT16U	sec
3564	0x04/0x06/0x10	Contact Output	T/S #04	Connection	FN103	R/W	INT16U	--
3565				Reset	Self(0), Manual(1)	R/W	INT16U	--
3566				Reset Delay	0 ~ 200.00 (0.01step)	R/W	INT16U	sec
3567	0x04/0x06/0x10	Contact Output	T/S #05	Connection	FN103	R/W	INT16U	--
3568				Reset	Self(0), Manual(1)	R/W	INT16U	--
3569				Reset Delay	0 ~ 200.00 (0.01step)	R/W	INT16U	sec
3570	0x04/0x06/0x10	Contact Output	T/S #06	Connection	FN103	R/W	INT16U	--
3571				Reset	Self(0), Manual(1)	R/W	INT16U	--
3572				Reset Delay	0 ~ 200.00 (0.01step)	R/W	INT16U	sec
3573	0x04/0x06/0x10	Contact Output	T/S #07	Connection	FN103	R/W	INT16U	--
3574				Reset	Self(0), Manual(1)	R/W	INT16U	--
3575				Reset Delay	0 ~ 200.00 (0.01step)	R/W	INT16U	sec
3576	0x04/0x06/0x10	Contact Output	T/S #08	Connection	FN103	R/W	INT16U	--
3577				Reset	Self(0), Manual(1)	R/W	INT16U	--
3578				Reset Delay	0 ~ 200.00 (0.01step)	R/W	INT16U	sec
3579	0x04/0x06/0x10	Contact Output	T/S #09	Connection	FN103	R/W	INT16U	--
3580				Reset	Self(0), Manual(1)	R/W	INT16U	--
3581				Reset Delay	0 ~ 200.00 (0.01step)	R/W	INT16U	sec
3582	0x04/0x06/0x10	Contact Output	T/S #10	Connection	FN103	R/W	INT16U	--
3583				Reset	Self(0), Manual(1)	R/W	INT16U	--
3584				Reset Delay	0 ~ 200.00 (0.01step)	R/W	INT16U	sec
3585 ~		Reserved						
Circuit Breaker Control								
4000	0x04/0x06/0x10	CB Open Counter			0 ~ 65535	R/W	INT16U	--
4001	0x04/0x06/0x10	Function			Disable(0), Enable(1)	R/W	INT16U	--
4002	0x04/0x06/0x10	Key Control			Disable(0), Enable(1)	R/W	INT16U	--
4003	0x04/0x06/0x10	CB Open Time			0.1 ~ 5.0	R/W	INT16U	sec
4004	0x04/0x06/0x10	CB Close Time			0.1 ~ 5.0	R/W	INT16U	sec
4005	0x04/0x06/0x10	CB Input			52a+52b(0), 52a(1), 52b(2)	R/W	INT16U	--
4006 ~		Reserved						
Password								
6500 ~6503	0x03	Password			0000 ~ 9999	R/O	INT16U	--
6504 ~		Reserved						

File (Event, Wave Recording File)							
Address (dec)	Func Code	Description		Range	Acce ss	Format	Units
60500 ~60519	0x06/0x10	File Open Operation	File Name(ID)		W/O	FN0	--
60520	0x06/0x10		File Open	RD(0)/WR(1)/RW(2)/AP(3)	W/O	INT16U	--
60521	0x06/0x10	File Close Operation		RD(0)/WR(1)/RW(2)/AP(3)	W/O	INT16U	--
60522	0x04	File Status		OK(0) / EOF(1)	R/O	FN10	--
* 60523 ~60524	0x04/0x06/0x10	Seek position (LSB)		1 ~ File size	R/W	FN11	Word
		Seek position (MSB)					
60525		Reserved					
60526 ~60527	0x04	File size (LSB)		0 ~ 4294967295	R/O	INT32U	Byte
	0x04	File size (MSB)					
60528	0x04	File Attribute		Read(0), Write(1), RW(2), AP(3), None(4)	R/O	FN6	--
60529 ~60599		Reserved					
60600	0x04	Buff Valid Byte Length			R/O	INT16U	Byte
60601	0x04	File buffer[0]			R/O	FN9	--
...	...	...		...	...	...	--
60724	0x04	File butter[123]			R/O	FN9	--
60725~		Reserved					--

* Attention *

1. File Open Operation When there is no communication read or write request signal for 10 seconds after communication input, all element values are forcibly initialized.

2. RS-232 or RS-485 When the file is open, the write function can not be used for communication that does not open the file. Response is given with exception code 5 (0x05).

3. When using Modbus Write Function Code (0x05, 0x06, 0x10), it responds with code value of exception processing 6 (0x0) when it is display screen which can not be controlled. However, the following contents can be written regardless of the display screen which can not be controlled.

Address(dec)	Function Code	Description	
2500	0x05	Remote Reset	
2504	0x05/0x06	CB Open Control	
2505	0x05/0x06	CB Close Control	
60500 ~60519	0x06/0x10··	File Open Operation	File Name(ID)
60520	0x06/0x10		File Open
60521	0x06/0x10	File Close Operation	
* 60523 ~60524	0x04/0x06/0x10	Seek position (LSB)	
		Seek position (MSB)	

<Regardless of the display screen which can not be controlled>

9. Register Formats

<table>
<tr><th>No.</th><th>Format Name</th><th>Description</th></tr>
<tr><td rowspan="18">FN0</td><td rowspan="15">File ID</td><td>
<table>
<tr><th>Address / ID</th><th>60500</th><th>60501</th><th>60502</th><th>60503</th><th>60504</th><th>60505 ~ 60519</th><th>ASCII 분석 내용</th></tr>
<tr><td>Event log File</td><td>0x7665</td><td>0x6E65</td><td>0x2E74</td><td>0x6F6C</td><td>0x0067</td><td rowspan="15">NULL</td><td>event.log</td></tr>
<tr><td>Waveform recording log File</td><td>0x6177</td><td>0x6576</td><td>0x315F</td><td>0x6C2E</td><td>0x7473</td><td>wave_1.lst</td></tr>
<tr><td>Waveform recording #1 *.cfg(config)file</td><td>0x6177</td><td>0x6576</td><td>0x315F</td><td>0x632E</td><td>0x6766</td><td>wave_1.cfg</td></tr>
<tr><td>Waveform recording #1 *.dat(data)file</td><td>0x6177</td><td>0x6576</td><td>0x315F</td><td>0x642E</td><td>0x7461</td><td>wave_1.dat</td></tr>
<tr><td>Waveform recording #2 *.cfg(config)file</td><td>0x6177</td><td>0x6576</td><td>0x325F</td><td>0x632E</td><td>0x6766</td><td>wave_2.cfg</td></tr>
<tr><td>Waveform recording #2 *.dat(data)file</td><td>0x6177</td><td>0x6576</td><td>0x325F</td><td>0x642E</td><td>0x7461</td><td>wave_2.dat</td></tr>
<tr><td>Waveform recording #3 *.cfg(config)file</td><td>0x6177</td><td>0x6576</td><td>0x335F</td><td>0x632E</td><td>0x6766</td><td>wave_3.cfg</td></tr>
<tr><td>Waveform recording #3 *.dat(data)file</td><td>0x6177</td><td>0x6576</td><td>0x335F</td><td>0x642E</td><td>0x7461</td><td>wave_3.dat</td></tr>
<tr><td>Waveform recording #4 *.cfg(config)file</td><td>0x6177</td><td>0x6576</td><td>0x345F</td><td>0x632E</td><td>0x6766</td><td>wave_4.cfg</td></tr>
<tr><td>Waveform recording #4 *.dat(data)file</td><td>0x6177</td><td>0x6576</td><td>0x345F</td><td>0x642E</td><td>0x7461</td><td>wave_4.dat</td></tr>
<tr><td>Waveform recording #5 *.cfg(config)file</td><td>0x6177</td><td>0x6576</td><td>0x355F</td><td>0x632E</td><td>0x6766</td><td>wave_5.cfg</td></tr>
<tr><td>Waveform recording #5 *.dat(data)file</td><td>0x6177</td><td>0x6576</td><td>0x355F</td><td>0x642E</td><td>0x7461</td><td>wave_5.dat</td></tr>
<tr><td>Waveform recording #6 *.cfg(config)file</td><td>0x6177</td><td>0x6576</td><td>0x365F</td><td>0x632E</td><td>0x6766</td><td>wave_6.cfg</td></tr>
<tr><td>Waveform recording #6 *.dat(data)file</td><td>0x6177</td><td>0x6576</td><td>0x365F</td><td>0x642E</td><td>0x7461</td><td>wave_6.dat</td></tr>
</table>
</td></tr>
<tr><td>Data Request Notes</td><td>1. When writing with Modbus Function 0x10, 0x06, Error will not occur if Write File ID value and File Open value are written together.

2. When changing the ID, you need to perform File Close and File ID and File Open.

3. When writing with Modbus Function 0x06, input File ID within 10 seconds after Write input.</td></tr>
<tr><td>Data Reading Order</td><td>1. Event log Read Data Order from File
- SeekPostion 1 to FileSize

2. Waveform recording log File Read sequence
- SeekPostion 1 to FileSize

3. Waveform recording * .cfg, Waveform recording * .dat order reading - ID # 1 ~ ID # 6</td></tr>
<tr><td>FN3</td><td>DNP Data & Time Format</td><td>A most significant number holds the number of minutes since 1/1/70
A least significant number holds the number of mill-seconds in the current minute.
1st word : Most significant(high word)
2nd word : Most significant(low word)
3rd word : Least significant</td></tr>
</table>

FN6	File Attributes	Bit Description 0: Read 1: Write 2: Read/Write 3: Append 4: None
FN7	File Mode	Open mode 0: Read Only 1: Write Only 2: Read/Write 3: Append
FN8	File Error Codes	0: No errors 1: Not Exist : Do not exist 2: No Permission : Unauthorized request error, ID input error 3: Already Opened : It is already opened, the data transfer is completed, the file is not sent. 4: Not Opened : Unopened state, forced termination, ID input error, file close and file open request 5: Not Process : RS-232 or RS-485 File Open Status
FN9	File Buffer	2Byte assemble into a word L-H order 0x12-0x34 ->0x3412
FN10	File Status	0: OK - Buff File is Not End of File 1: EOF(1) - Buff File is End of File * The File Status value is updated after the File Buffer call.
FN11	Seek position	◈ UNSIGNED 32 BIT INTEGER (0 ~ 4294967295) ◈ <u>Seek position</u> Seek position register (60523) will be saved in File Buff from the start size. If File Buff [0] ~ File Buff [123] is read again, the current file data stored in Buff will be handed over. Seek position must be greater than 0 and less than or equal to File size. <caution> 1. vent log File Seek position value when requested : Seek position Size value = 124 * N [Word] 2. Waveform recording log File request Seek position value: Seek position Size value = 124 * N [Word] 3. Waveform recording log * .cfg File request Seek position value: Seek position Size value = 124 * N [Word] 4. Waveform recording log * .dat File request Seek position value: Seek position Size value = 120 * N [Word] Where N is the number of frames in File Buff [0] through File Buff [123]
FN20	CB Open/Close Operate Error Code	◈ UNSIGNED 16 BIT INTEGER (0 ~ 65535) ◈ The meaning of the error code when controlling CB Open / Close operation is as follows. However, only RS-485 communication can be controlled.

<table>
<tr><td></td><td></td><td>
<table>
<tr><th>Error code</th><th>Contents</th></tr>
<tr><td rowspan="3">3</td><td>Connection state of CB input contact is unknown</td></tr>
<tr><td>Error code when Open is requested when CB state is Open</td></tr>
<tr><td>Error code when requesting Close when CB state is Close</td></tr>
<tr><td>4</td><td>Error handling code when CB Control setting is Local Mode</td></tr>
</table>
</td></tr>
<tr><td>FN100</td><td>Communication BPS</td><td>ENUMERATION
0: 300
1: 600
2: 1200
3: 2400
4: 4800
5: 9600
6: 19200</td></tr>
<tr><td>FN101</td><td>TOCR Curve</td><td>ENUMERATION
0: DT
1:,NI
2: VI
3: EI
4: LI
5: KNI
6: KVI
7: KLNI
8: KLVI</td></tr>
<tr><td>FN102</td><td>TOCGR Curve</td><td>ENUMERATION
0: DT
1:,NI
2: VI
3: EI
4: LI
5: KNI
6: KVI
7: KLNI
8: KLVI</td></tr>
<tr><td>FN103</td><td>Contact Output</td><td>ENUMERATION
0: OFF
1: CB_OPEN
2: CB_CLOSE
3: ALL_PROT
4: OCR
5: TOC
6: IOC
7: OC_A
8: OC_B
9: OC_C
10: TOC_A
11: TOC_B
12: TOC_C
13: IOC_A
14: IOC_B
15: IOC_C
16: OCGR
17: TOCG
18: IOCG</td></tr>
</table>

		19: SGR 20: OVR 21: OV_A 22: OV_B 23: OV_C 24: UVR 25: UV_A 26: UV_B 27: UV_C 28: OVGR 29: TOVG 30: IOVG 31: NSOVR 32: OC+OCG 33: TOC+TOCG 34: IOC+IOCG 35: OC+SG 36: OC+OV 37: OC+UV 38: OC+OVG 39: OC+NSOV 40: OCG+SG 41: OCG+OV 42: OCG+UV 43: OCG+OVG 44: OCG+NSOV 45: SG+OV 46: SG+UV 47: SG+OVG 48: SG+NSOV 49: OV+UV 50: OV+OVG 51: OV+NSOV 52: UV+OVG 53: UV+NSOV 54: OVG+NSOV 55: SYS_ERR
FN104	Direction	ENUMERATION 0: Disable 1:,Forward 2: Reverse
FN105	CB Control Status	ENUMERATION 0: Disable 1:,Open 2: Close 3: Trouble

10. Event Recording File Format

Type 0 Event Format

<TYPE>,<DATE/TIME>,<EVENT ID>,<CR/LF>

ex) 0,2001/05/08,20:16:24.999,System Reset-Power On<CR,LF> -> 52 characters

Type 1 Event Format

<TYPE>,<DATE/TIME>,<EVENT ID>,<Field#1>,<Field#2>,...,<Field#n><CR/LF>

ex) 1,2001/05/08,20:16:24.999,IOCR Start-(A / /)

Ia:5.00A,0.0’,Ib:1.00A,0.0’,Ic:0.00A,0.0’,In:12.00A,0.0’ ->Max.52*4 characters

11. Waveform Recording File Format

COMTRADE File Format

Configuration and Data File supported

1) *.cfg File Format

L-H Order 2Byte ASCII

ex) 3,2A,1D<CR/LF>

File Buff: 0x2C 0x33 0x41 0x32 0x31 0x2C 0x0D 0x44 0x0A

ASCII : ',' '3' 'A' '2' '1' ',' <CR> 'D' <LF>

Read : 3,2A,1D<CR/LF>

2) *.dat File Format

L-H Order 2Byte assemble into a word

ex) File Buff: 0x12 0x34

Read : 0x3412

TOYO TECHNICAL CO., LTD.
Headquarter: 6F No.68 Xing Ai Rd. Taipei, Taiwan, R.O.C.
TEL: +886-2-8791-8588 Taichung: +886-4-2296-9388
FAX: +886-2-8791-9588 Kaohsiung: +886-7-227-2133
E-mail: toyotech@ms37.hinet.net Website: www.toyotech.com.tw